

VERSA-WHIRL BATHS - "LTB" SERIES

AUTOMATIC TRANSFER SYSTEM

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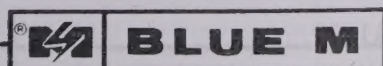
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MP MASTER



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GENERAL INFORMATION AND WARRANTY
VERSA - WHIRL BATHS - "LTB" SERIES

FORWORD

This manual will acquaint the operator with the equipment. A thorough understanding of the functions of the component parts of the bath will help the operator attain proficiency of operation and, thus, produce test results compatible with the capabilities of the equipment.

Blue M Versa-Whirl Baths are manufactured to our highest standards and are designed to give superior service if properly installed and maintained.

Schematic drawings, charts, etc., are included for the electrical wiring along with other information for maintaining and servicing the equipment.

Blue M maintains factory - trained service personnel for your convenience. Should our assistance be desired, contact your nearest Blue M sales and service office.

Due to the wide variety of equipment manufactured by Blue M and the Blue M policy of change in materials to improve a product, these manuals are general in nature.

BATH FLUIDS

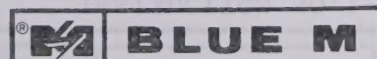
The selection of a suitable fluid for this series of baths will vary with the specific application, model and operating temperature.

Suitable fluids include the fluorocarbon fluids, silicone fluids, high temperature oils, ethylene glycol solutions, methylene chloride, trichloroethylene, etc.

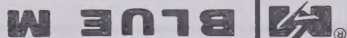
For technical information and assistance in the selection of a suitable fluid for your specific application, we suggest that you contact the manufacturer of the fluid directly. Typical companies include General Electric, Dow Corning Corp., Chemical Division of 3M Company and Union Carbide Corp.

CAUTION

VERSA-WHIRL BATHS ARE NOT DESIGNED FOR USE WITH WATER AS A BATH FLUID. UNDER NO CIRCUMSTANCES SHOULD WATER BE USED.



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WARRANTY - BLUE M

The seller shall repair or replace, free of charge, such part or parts of the equipment sold that may prove defective in workmanship or material within one year from date of shipment. The warranty extended for parts does not include the replacement of refrigerant, oil or dehydrators. Defective parts must be returned to Blue M, prepaid. Replacement or repaired parts shall be returned to the user, collect. Labor to remove and reinstall parts is the responsibility of the purchaser, unless otherwise noted on the contract covering this equipment.

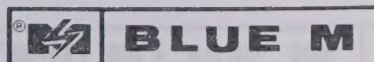
WARRANTY

INSTALLATION PROCEDURE
VERSA-WHIRL BATHS - "LTB" SERIES
AUTOMATIC TRANSFER MODELS

1. After uncrating the unit, examine the equipment for any possible shipping damage. For your protection, when shipping damage to the equipment is discovered, do not discard the shipping container. It will be inspected, along with the equipment, by a representative of the carrier, when you submit a claim for damages.
2. The unit should be located on a level floor, which has a suitable firm foundation to withstand the additional load of the bath and its contents. Sufficient clearance should be left completely around the test chamber to facilitate servicing and also to give proper air circulation. In portable machines, care should be exercised to have the machine level when in operation. The location chosen for the unit should be accessible to electrical and compressed air supplies.
3. Loosen the shipping nuts on the four legs of the compressor(s) until it floats freely. Reference drawing I-303-15.
4. Connect proper power source to unit. Consult data plate, located on unit, for required voltage and connected load. For units without line cord, feed power supply through a separate fused safety disconnect switch, not supplied, to the outlet box located at the rear of the unit.

Be sure chamber is properly grounded. This is usually accomplished by using metal conduit to connect power to the unit. If grounding is questionable, connect a separate ground wire from the metal frame of unit to a suitable electrical ground, such as a water pipe, conduit, etc.

NOTE: In all cases local electrical codes take precedence.



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5. Air Supply Connections: Reference Drawing #BC-513-2-E. The air supply connections for the entire pneumatic system are 1/4" F.N.P.T. They are located on the air filter.

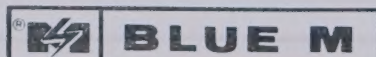
The automatic transfer system is equipped with an air filter, pressure regulator, and lubricator.

6. Positive air pressure applied directly to oil in the air over oil storage. Tanks produces hydraulic power for activating the transfer of workload basket. Set the flow control valves to 3 for proper speed of transfer.

WARNING: DO NOT OPEN VALVES TO FULL CAPACITY. TRANSFER SPEED WILL BE HAZARDOUS AND MAY CAUSE DAMAGE OR INJURY.

Before applying air pressure to transfer system, determine whether oil is present in storage tanks. When piston is positioned to the extreme right, oil level in right storage tank should read full. When piston is positioned to the extreme left, oil level in left storage tank should read full. If tanks are empty, follow the filling sequence outlined below:

- 1) Open both flow control valves.
- 2) Close equalizing valve.
- 3) Rotate shaft to position piston to far right.
- 4) Pour oil into right tank to full mark. Use Texaco Regal 32 R&O
- 5) Slowly rotate shaft to position piston to far left. Continue pouring oil into right tank to prevent level from reaching bottom of tank.
- 6) With piston positioned extreme left, fill left tank to full mark.
- 7) Rotate shaft to move piston back and forth several times, until no air bubbles are visible in sight glass.



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- 8) Continue to add oil so that when piston is in extreme left position, left tank is full and when piston is in extreme right position, right tank is full.
- 9) Oil level equalizing valve should be used only when the tanks are improperly filled; i.e., when one tank is over-filled and the other underfilled.

To properly use equalizing valve, move basket to center position, open valve to equalize oil levels, close valve when oil levels are identical in both tanks.

AIR FILTER

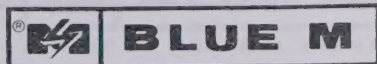
Air filter threads are equipped with a "Dry Seal" but pipe compound may be used as an added means of preventing leaks. Separator bowl must be drained periodically by opening drain cock (clockwise). This should be done before level reaches the baffle. If filter element still appears to be dirty after separator bowl has been drained it can be removed by unscrewing bowl retaining ring and removing bowl. Unscrewing baffle releases filter element. Filter element can be cleaned with methanol alcohol. Be sure to blow out from the inside before reassembling. Bowl should be cleaned with household soap only. Never use carbon tetrachloride, thinner, acetone or similar solvents.

PRESSURE REGULATOR

Clockwise turning of the adjustment screw increases the regulated pressure. Adjust to 65 P.S.I.G.

PRESSURE GAUGE

Indicates regulated pressure.



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LUBRICATOR

Fill lubricator with SAE #10 non detergent oil through either fill plug until 1/4" from top of bowl. The "Dial Set" knob is factory adjusted so no oil is delivered with a "0" setting. Start with a setting of #1 as indicated on the "Dial Set" knob and observe use. Proper adjustment is best determined by observing the oil reservoir in the agitation motors. Too high of a setting will produce an oil vapor at the exhaust of the agitation motor. Lubricator may be cleaned in the same manner as the filter when required.

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OPERATING INSTRUCTIONS FOR BLUE M
AUTOMATIC TRANSFER SYSTEM
OIL FOR
AUTOMATIC TRANSFER SYSTEM

I. GENERAL

TEXICO REGAL 32 R+O

This system is designed to operate in conjunction with an LTB-1-P200 and an LTB-Cold Bath. Piece parts to be tested are placed in a basket and automatically cycled from hot to cold for a predetermined amount of cycles and then automatically stopped. The number of cycles desired is set on the cycle counter mounted in a separate control cabinet mounted on the right side of bath assembly. The amount of time in the bath is set on the hold timer also mounted in the same control cabinet. Refer to enclosed instructions for setting procedures for these two instruments.

II. START-UP PROCEDURE FOR AUTOMATIC OPERATION

- 1) Start with all controls in "OFF" position.
- 2) Set desired temperature for baths and allow them to stabilize. (Refer to enclosed instructions).
- 3) Set hold timer to desired duration. This setting will determine length of time that basket is kept in each bath.
- 4) Adjust cycle counter to desired number of cycles. One count will register each time the basket crosses the center when moving from left to right. (One count equals a full cycle, right bath and left bath).
- 5) Move operator counter control switch to "RESET" position.
- 6) Move Manual/Automatic switch to "AUTOMATIC". Basket will move to right (high-temperature) bath.
- 7) Place counter control switch in "START" position.
- 8) Turn on Main switch.

This unit will now operate automatically until the pre-set number of cycles are completed.

III. START-UP PROCEDURE FOR MANUAL OPERATION

- 1) Place Manual/Auto switch in "MANUAL" position.
- 2) Move manual control toggle switch to place basket in desired position; "LEFT", "RIGHT", or "HOLD".

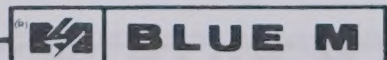
IV. SERVICE PROCEDURES

Baths are factory calibrated to customer's specs. Refer to enclosed instructions for recalibrating and servicing procedures for each bath. If system is supplied with recorder, refer to operating and maintenance instructions enclosed.

If problems arise, contact your nearest authorized service representative for aid. A normal amount of caution and good housekeeping practices should be followed. The high temperature bath is designed to operate at 200°C. max. At elevated temperatures, the viscosity of the bath oil drops drastically and is very easily splashed. Caution should be taken to avoid this splashing. Hot oil fumes also have a tendency to condensate on any colder surface. This condensed oil film should be wiped away periodically to assure trouble-free operation.

The entire electrical wiring compartment for the transfer system is easily accessible by an access door located on the right side of the control cabinet.

NOTE: This system is comprised of two (2) standard baths, one hot and one cold, used in conjunction with a transfer mechanism. Enclosed are operating instructions and wiring diagrams for each of these baths as well as a wiring diagram for the transfer mechanism.

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SPECIFICATIONS

APPLICATION: THERMAL SHOCK TESTING
MIL-STD.-883, METHOD 1011
TEST CONDITIONS A,B,C AND D
(OR EQUIVALENT)

TEMPERATURE RANGE:

(LOW TEMPERATURE BATH) MODEL #LTB-1-M75C
0°C. TO -75°C.

(HIGH TEMPERATURE BATH) MODEL #LTB-1-P200C
AMBIENT TO +204°C.

BASKET: (WORK SPACE) APPROXIMATELY 390 CUBIC INCH VOLUME.
BASKET DESIGNED FOR FAST, EASY REMOVAL.

INSTRUMENTATION:

(F) (TEMPERATURE CONTROL) - FOR HOT AND COLD BATHS, "DIALA-TROL" INDICATING
TEMP. CONTROLLER.

(DWELL TIMER) 0 TO 60 MINUTES

(E) (CYCLE COUNTER) COUNT RANGE: MIN. 2, MAX. 100

NOTE:

CONTROL CIRCUITS PROVIDE FULLY AUTOMATIC OPERATION AFTER FIRST
SETTING DWELL TIME AND NUMBER OF CYCLES DESIRED. BASKET ALWAYS
STARTS IN RIGHT-SIDE BATH (HOT BATH) FIRST. IN ADDITION,
A CONTROL SWITCH IS PROVIDED FOR MANUAL OPERATION.

LOAD LIMIT: 5 POUNDS

POWER VOLTAGE:

240 VOLTS, SINGLE PHASE, 60 CYCLE.
(CONTROL VOLTAGE) 120 VOLT, SINGLE PHASE, 60 CYCLE SUPPLIED
FROM A SEPARATE CONTROL TRANSFORMER. TOTAL CONNECTED LOAD,
4000 WATTS.

ELECTRICAL:

ALL WIRING IN ACCORDANCE WITH NEC. STANDARDS.

REMARKS:

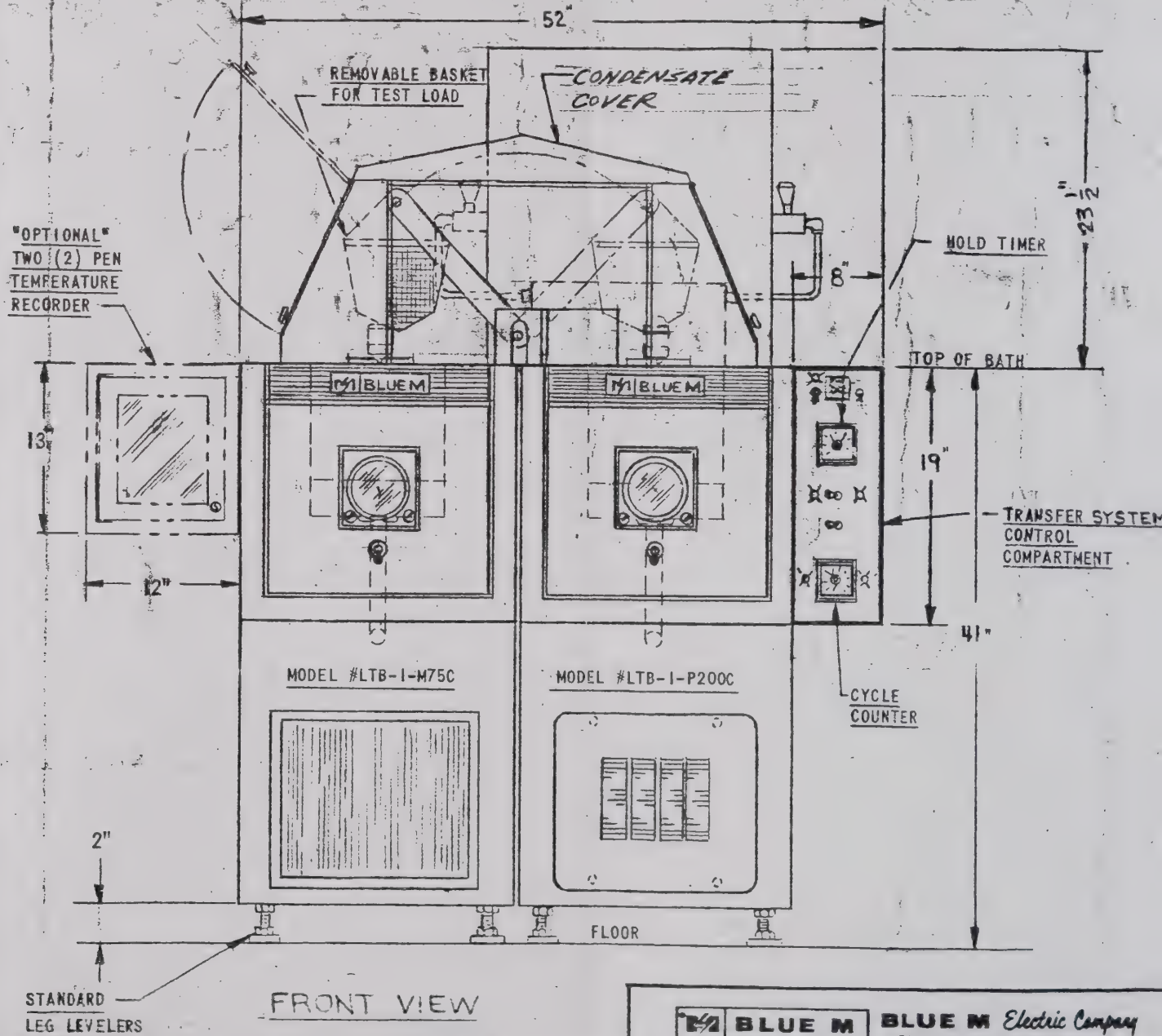
FOR ADDITIONAL INFORMATION PERTAINING TO INDIVIDUAL BATHS, REFER
TO BLUE M DRAWING BC-467.

(G) EQUIPPED WITH PLEXIGLASS AND STAINLESS STEEL
CONDENSATE COVER, PLEXIGLASS DOOR ON EACH SIDE.

(STANDARD OPTIONAL EQUIPMENT)

- 1) TWO (2) PEN TEMPERATURE RECORDER CAT. #CO2D-1-2
- 2) HEAVY DUTY CASTERS CAT. #CA-100.

NOTE: WHEN OPTIONAL CASTERS ARE USED,
AN ADDITIONAL TWO (2) INCHES MUST
BE ADDED TO ALL HEIGHT DIMENSIONS
SHOWN.



BLUE M **BLUE M Electric Company**
BLUE ISLAND, ILLINOIS, U.S.A.

PART NAME MODEL #LTB-ATS-2 (SINGLE BASKET)
AUTOMATIC TRANSFER SYSTEM

USED WITH LTB-I-P200C and LTB-I-M75C

SCALE
3/32=1"

DATE
9-11-70

DRAWING NO.
SHEET 1 OF 2

REV
E

DRAWN
G.K.

CHECKED

BC-513-1

KJS	HVC	G	ADDED CONDENSATE COVER	KEY	2-26-BD
CHKD.	APPD.	LET.	REVISIONS	BY	DATE

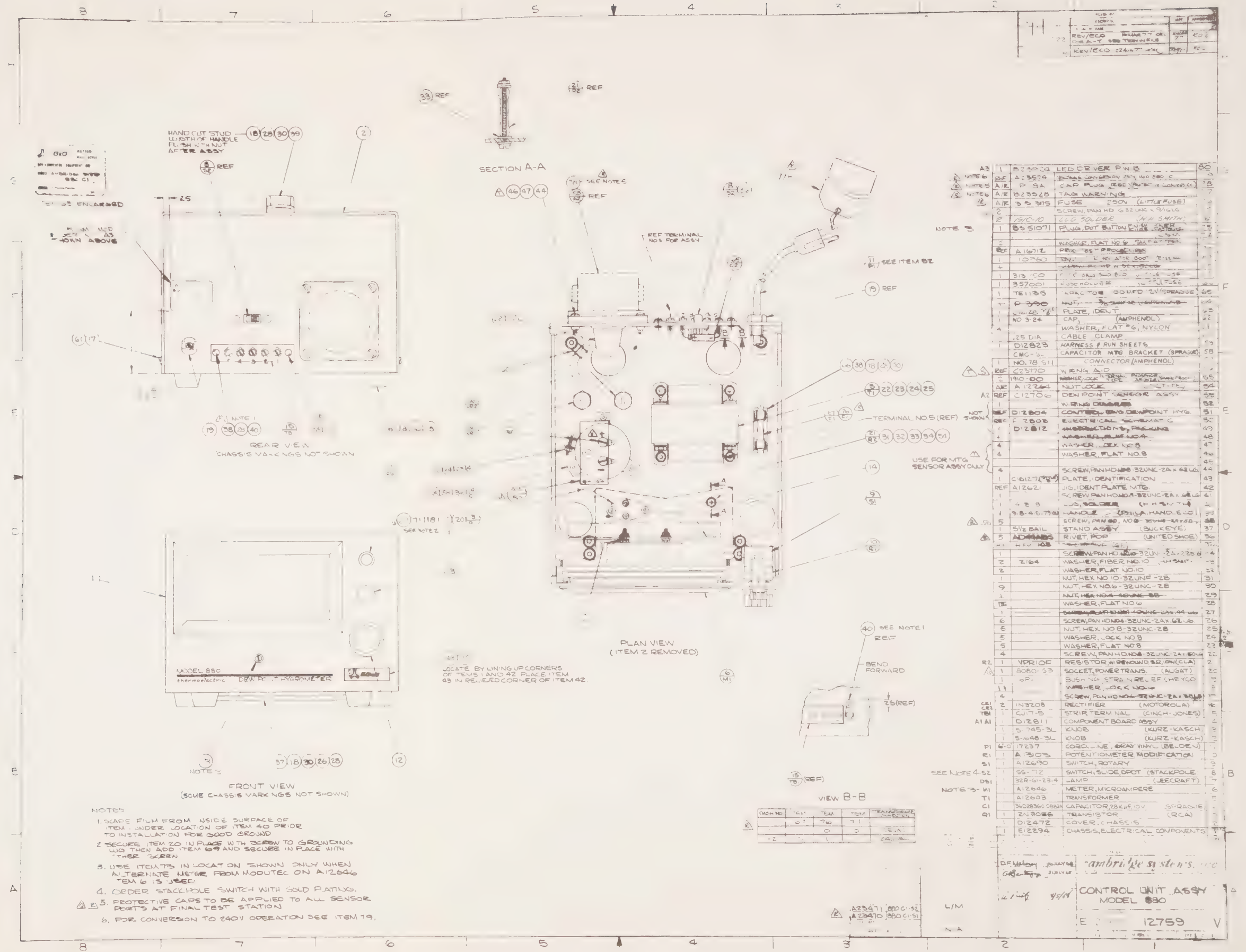
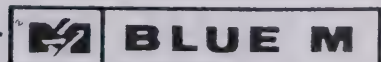


Figure 11. Control Unit Assy, Model 880, E-12759.

ATS - TRANSFER SYSTEM
BASKET LOADING INSTRUCTIONS

ATS -Transfer system is provided with a work load basket which operator can dismount from transfer mechanism, To dismount, lift work load basket vertically off of mounting bracket.

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A UNIT OF GENERAL SIGNAL
BLUE ISLAND BUILDING 60401



INSTALLATION PROCEDURE
VERSA-WHIRL BATHS - "LTB" SERIES
NON-REFRIGERATED MODELS

1. After uncrating bath, examine the equipment for any possible shipping damage. For your protection, when shipping damage is discovered, do not discard the shipping container. It will be inspected, along with the equipment, by a representative of the carrier, when you submit a claim for damages.
2. The bath should be located on a level floor, which has a suitable firm foundation to withstand the additional load of the bath and its contents. Sufficient clearance should be left completely around the test chamber to facilitate servicing and also to give proper air circulation. In portable machines, care should be exercised to have the machine level when in operation. The location chosen should be accessible to electrical and compressed air supplies.
3. Connect proper power source to unit. Consult data plate, located on unit, for required voltage and connected load. For units without line cord, feed power supply through a separate fused safety disconnect switch, not supplied, to the outlet box located at the rear of the bath.

Be sure chamber is properly grounded. This is usually accomplished by using metal conduit to connect power to the unit. If grounding is questionable, connect a separate ground wire from the metal frame of unit to a suitable electrical ground, such as a water pipe, conduit, etc.

For units with line cord, it is necessary only to plug cord into appropriate grounded receptacle.

NOTE: In all cases local electrical codes take precedence.

4. Air Supply Connections:
Applicable to all models except ATS-1. For ATS-1 air supply connections refer to drawing B-462-10B.

For All Other Models:

Connect air supply (as indicated on nameplate) to 1/8" F.P.T. connection on agitation motor on top of unit. Place a moisture trap, filter and oiler in air line ahead of motor. Pipe or hose should be no smaller than the nominal pipe size at intake port. Hose must have sufficient wall strength to withstand air pressure used. Bath will operate efficiently with a 60 PSIG air supply. Reference Instruction I-200-2.

CONTROL EQUIPMENT
VERSA-WHIRL BATHS - "LTB" SERIES
MODELS WITHOUT MECHANICAL REFRIGERATION

In order to more properly understand this machine, the operator should be familiar with its various controlling devices. The following is a brief description of these devices and their functions.

1. MAIN SWITCH

Bath is equipped with a main control switch on control panel. This switch energizes temperature control. It does not control the air-operated agitation motor.

2. AGITATION MOTOR - AIR-OPERATED

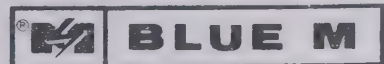
Motor is top-mounted at rear of bath, with stirring propeller on lower end of shaft. Motor is provided with a valve which allows infinite variation of speed between 0 - 6000 RPM. Valve on top of motor controls speed; turn to left (counterclockwise) to increase speed, turn to right (clockwise) to decrease. Turning knob fully to right (clockwise) stops motor. Reference instruction no. I-200-2.

3. DIALATROL INDICATING TEMPERATURE CONTROL

Instrument controls heating element through a mercury power contactor or solenoid valve for expendable refrigerant, depending on model. Reference instruction no. I-102-2 and 95-8148-1.

4. THERMOMETER

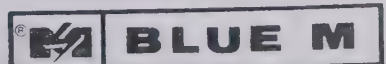
Thermometer is a dial type and is installed through top cover of bath near agitation motor.



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OPERATING PROCEDURE
VERSA-WHIRL (SERIES "LTB") TEMPERATURE BATHS

1. Fill bath with desired fluid.
2. Set Temperature Control to desired setpoint.
3. Adjust Agitation Motor for desired agitation speed. An increase in agitation speed will increase heat transfer and result in improved uniformity.
4. Turn on Main Control Switch.
5. Observe Bath Temperature Indicator for exact temperature. After temperature has stabilized, readjust Control Setpoint, if required. Refer to enclosed control manufacturer's instructions.



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INSTALLATION PROCEDURE
VERSA-WHIRL (SERIES "LTB") TEMPERATURE BATHS
REFRIGERATED MODELS

1. Carefully uncrate bath and examine for any possible shipping damages.
2. Bath should be located on a level floor, which has a suitable firm foundation to withstand the additional load of the bath and its contents. Sufficient clearance should be left completely around the bath to facilitate servicing and also to allow for proper air circulation.
3. Loosen shipping nuts on four legs of compressor until it floats freely.
4. All service valves are factory set. DO NOT alter setting.
5. On water cooled units, attach water supply line to pipe coupling, identified as "Water Supply", located on the back or side of compressor section. The size of the supply line must be equal to or greater than the pipe size of this coupling and must carry at least 40 PSIG pressure at all times. It is recommended that a shut-off valve be placed in water line before the bath.
6. On water cooled units, attach drain line to pipe coupling located along side the "Water Supply". This line must be equal to or greater than the pipe size of this coupling and may be connected to pressure drain or floor drain.
7. Connect proper power source to unit. Consult data plate, located on bath, for required voltage and connected load. For units without line cord feed power supply through a separate fused safety disconnect switch, supplied by others, to the terminals on the power terminal block located in the electrical compartment of the bath. Grounding can be accomplished by connecting a separate ground wire from the metal frame of the bath to a suitable ground, such as water pipe or conduit. These are the only electrical connections necessary.

For units with line cord, it is necessary only to plug cord into appropriate grounded receptacle.

8. Self-contained temperature baths have compressors and other refrigeration equipment completely connected and no further connections must be made other than the electrical and water connections as previously mentioned.
9. Connect air supply (as directed on name plate) to agitation motor on top of unit. Place a moisture trap and filter in air line ahead of motor. Pipe or hose should be no smaller than the nominal pipe size of intake port. Hose must have sufficient wall strength to withstand air pressure used.

10. SPECIFICATIONS

Consult specification data plate located on bath for type refrigeration system, refrigerant charge, required water supply, air supply, voltage, and connected load.

SR/jr 2/83



CONTROL EQUIPMENT
VERSA-WHIRL BATHS - "LTB" SERIES
CASCADE REFRIGERATION

In order to properly understand this machine, the operator should be familiar with its various controlling devices. The following is a brief description of these devices and their functions.

1. MAIN SWITCH

Bath is equipped with a main control switch on control panel. This switch energizes temperature control, compressor motor starters, and refrigerant solenoids. It does not control the air-operated agitation motor.

2. AGITATION MOTOR - AIR-OPERATED

Motor is top-mounted at rear of bath, with stirring propeller on lower end of shaft. Motor is provided with a valve which allows infinite variation of speed, between 0-6000 RPM. Valve on top of motor controls speed; turn to left (counterclockwise) to increase speed, turn to right (clockwise) to decrease. Turning knob fully to right (clockwise) stops motor. Reference instruction no. I-200-2.

3. DIALATROL INDICATING TEMPERATURE CONTROL

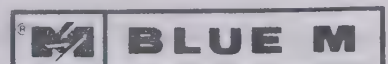
This instrument controls refrigerant solenoid valves, regulating the flow of refrigerant in accordance with conditions. Reference instruction no. I-202-2 and manufacturer's instruction no. 95-8148-1.

4. THERMOMETER

Thermometer is a dial type and is installed through top cover of bath near agitation motor.

5. CRANKCASE PRESSURE REGULATING VALVE

The crankcase pressure regulating valve is provided to limit the maximum low side pressure at the refrigerant-13 compressor inlet. This valve is factory set at a point where a balance of capacity is achieved between the refrigerant-22 and the refrigerant-13 systems and should require no adjustment. This pressure setting is usually between 8 to 15 PSIG. At conditions of overload, the valve



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modulates to prevent suction gas pressures at the compressor inlet above that for which the valve is adjusted. When the condition of overload has passed and the suction pressure drops below the valve setting, the valve assumes a wide open position during the balance of operation.

6. REFRIGERANT-22 HIGH PRESSURE CUT-OUT - FACTORY SET

This high pressure control is wired in series with both refrigerant-22 and refrigerant-13 compressor motor starters. In the event the pressure becomes higher than the setting, both the refrigerant-13 and the refrigerant-22 compressors will stop. When the discharge pressure is lowered to the differential of the control, the compressors will again start. Reference RD-347-17-1.

7. REFRIGERANT-13 HIGH PRESSURE CUT-OUT - FACTORY SET

This high pressure control is wired in series with the refrigerant-13 compressor motor starter. Pressures higher than the setting will cause the compressor to stop. The refrigerant-22 compressor will continue to operate, lowering the temperature of the cascade condenser. This condition continues until the high pressure of the refrigerant-13 is lowered to the cut-in setting of the control, again starting the refrigerant-13 compressor. Reference RD-347-17-1.

8. REFRIGERANT-13 HIGH PRESSURE CUT-IN - FACTORY SET

This high pressure control is wired in series with the refrigerant-22 compressor motor starter. When the discharge pressure of the refrigerant-13 compressor is lowered by the refrigerant-22 system to the setting of the control, it will cause the refrigerant-22 compressor to stop. When the discharge pressure increases to the differential of the control, the refrigerant-22 compressor will start.

This control is provided for the purpose of maintaining a controlled operating high pressure of the refrigerant-13 system when operating at minimum load conditions. Reference RD-347-17-1.



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HONEYWELL DIALATROL TEMPERATURE CONTROLINTRODUCTION

The Honeywell model R7350 Dialatrol is a solid state indicating temperature control of potentiometric design featuring advance integrated circuitry with adjustable time proportioning. An independent, isolated meter circuit provides continuous visual indication of chamber temperature if it is within 50% of the scale span. Green pilot light in meter face glows when temperature is below setpoint; red pilot light indicates temperature above setpoint. The single pole, double throw output relay is used to control heating or cooling circuits of chamber.

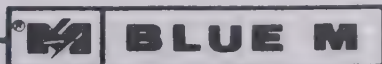
OPERATING INSTRUCTIONS

Do not attempt to operate unit until these instructions, as well as the instructions furnished with the basic chamber, have been thoroughly read and understood. The Dialatrol has been completely wired and calibrated, and is ready to operate. With reference to chamber operating instructions, turn ON chamber circuit breaker, main switch or fused disconnect. Set overtemperature device if so equipped. Dialatrol white operating light and either red or green pilot light will be illuminated when the unit is properly energized. Adjust setpoint for the desired control point with the large circular dial on the front of the unit. Rotate dial until setpoint temperature desired is aligned with black mark in red triangle just above the mirrored area of the circular dial face.

As chamber temperature approaches setpoint, the cycler (time proportioning action) will begin controlling the length of time the output relay is energized and de-energized. Normal operation at setpoint is indicated by alternate red and green pilot lights being illuminated, and temperature indicator needle will align with the center of the red triangle. Unit should continue to operate in this fashion, giving virtual straight line control until it is desired to either shut the unit down or change to a different set temperature.

ADJUSTMENTS FOR MAXIMUM CONTROL CAPABILITIES

This temperature control system has been factory calibrated and adjusted to give excellent temperature control characteristics. However, once a specific temperature load or other thermal characteristics of the heating system are established, a slight fine tuning may be necessary to improve performance.



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Six (6) screwdriver adjustable potentiometers can be exposed on the right hand side of the control by releasing the lock at the lower left hand corner of the dial face and drawing the entire control face about 3 1/2" out of its mounting box. The three pots marked P1, P2 and P151 are used to calibrate the control and should not be adjusted unless complete facilities for calibrating the system are available. However, the three pots marked PROP-BAND (proportioning band), CYCLE-RATE, MAN RESET (manual reset) can be adjusted to improve performance under specific operating conditions. Before making any adjustment of these pots be sure to clearly mark the factory settings so that initial conditions can be duplicated if improper adjustment is made.

CYCLE RATE ADJUSTMENT

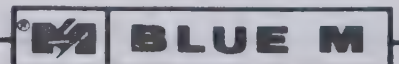
Decreasing the cycle rate slows down the controller's switching action, and increases the life of the external power handling device. Too great a decrease in the cycle rate will cause temperature to cycle slightly above and below desired set temperature. Increasing the cycle rate speeds up switching action and reduces power controller life but improves overall temperature control characteristics. Optimum adjust is as fast as possible in keeping with reasonable life of power handling device. In the case of units provided with SCR switches or mercury relay, cycle rate should be set to maximum. Units with mechanical contactors or relays, cycle rate should be set as slow as possible to maintain acceptable temperature control.

PROPORTIONING BAND

Turn the potentiometer clockwise to increase width of proportioning band or counter-clockwise to decrease width of proportioning band. If control is full counter-clockwise to position marked OFF, unit becomes an ON/OFF control generally producing very poor temperature control characteristics. For optimum control, proportioning band should be adjusted as narrow as possible without going into the OFF position and without causing either instability of control temperature or overshoot on run-up. Best results are usually obtained with the pot turned approximately 1/4 turn clockwise from the OFF position.

MANUAL RESET

Making any of above adjustments may cause indicating meter to indicate a constant value above or below the null position. A deviation of this type is called 'offset' or 'droop'. Turning



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manual reset pot to plus (+) will eliminate an above null offset.

NOTE 1: IN MAKING ANY ADJUSTMENT, ALLOW SUFFICIENT TIME FOR CONTROLLER AND THERMAL SYSTEMS TO STABILIZE. AN ABSOLUTE MINIMUM OF 1/2 HOUR IS REQUIRED ON LOW TEMPERATURE UNITS. HIGH TEMPERATURE UNITS REQUIRE AT LEAST 1 HOUR TO STABILIZE.

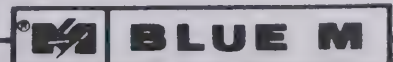
NOTE 2: INDICATING METER OF THIS DEVICE IS OF THE JEWEL AND PIVOT TYPE CONSTRUCTION. GENTLY TAPPING FACE OF METER MAY ELIMINATE SLIGHT PIVOTAL FRICTION GIVING MORE ACCURATE READINGS OF INSTRUMENT.

Adjustment of proportioning band and cycler control as described above should be used primarily as a guideline to achieve optimum operation. Settings for these controls depend upon such things as chamber load, operating temperature, and other variable factors. The final settings may require some experimentation as well as a compromise where a multitude of conditions and factors are involved.

THERMOCOUPLE

The Dialatrol has built-in thermocouple break protection. In the event of an open circuited thermocouple, controller gives a false above setpoint indication and controller switch will open shutting OFF heat to unit. For cooling control applications, it may be modified to provide below setpoint indication and switching.

Thermocouple replacement does not require adjustment of control system. Be sure proper thermocouple and correct lead wire are used, and observe polarity when making connection. Negative lead is usually identified by red insulation. When installing thermocouple, take precaution to prevent lead wire from running closely parallel to electric power wiring.



BLUE M *Electric Company*

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AGITATION SYSTEM
AIR OPERATED

DESCRIPTION

The air operated mixer installed on this chamber is designed to offer many years of reliable service with very little maintenance when connected to a reliable source of compressed air as covered in installation instructions. It is supplied with a needle valve speed control which will regulate the mixer between 0 and 6000 RPM. It drives a stainless steel propeller which is coupled to the motor by a stainless steel shaft.

OPERATION

The needle valve speed control will increase speed of mixer when turned counterclockwise, and decrease speed of mixer when turned clockwise. Increasing the agitation speed will increase heat transfer, resulting in improved uniformity. Too much agitation can cause splashing. Typically a control valve setting of 1/2 turn open produces desirable results. Be certain to turn valve fully clockwise to stop mixer when bath is not in use.

LUBRICATION

Lubrication is accomplished through oil port located on top of mixer and must only be attempted with air supply off. The thumb screw type plug for this port must be removed during lubrication. It is marked "oil". SAE10 non-detergent oil is recommended for best results.

Frequency of lubrication will vary with operating temperature, type of fluid, etc. Installation of an in-line oiler will supply a degree of constant lubrication, minimizing supplementary oilings. Periodic inspection of oil reservoir is the best method of determining a schedule of lubrication suited to your particular needs. Insufficient lubrication will cause damage to motor.

REFRIGERATION SYSTEM FOR BLUE M ELECTRIC COMPANY
TOP OPENING SERIES AND VERSA-RANGE TEMPERATURE CHAMBERS
(CASCADE)

High Temperature Refrigerant)) See enclosed Refrigeration
Low Temperature Refrigerant) System data sheet

DESCRIPTION OF REFRIGERATION EQUIPMENT

The equipment supplied with this chamber consists of a cascade type refrigeration system, employing two separate refrigerants. Low Temperature System refrigerates test chamber and transfers heat picked up to High Temperature System by means of thermal contact in the cascade condenser. The cascade condenser basically, is a shell and tube arrangement with Low Temperature Refrigerant circulating in the shell and High Temperature Refrigerant circulating in the tubes. With this arrangement, the heat is transferred from the Low Temperature Refrigerant in the shell to the High Temperature Refrigerant in the tubes. The High Temperature System then transfers the heat to the condenser, either air or water cooled. Both phases of the system use single stage refrigeration compressors.

The LOW TEMPERATURE Phase of the Cascade System operates as follows:

In the compressor, the refrigerant is put under pressure and passes through the discharge service valve into a heat exchanger, called a desuperheater, where a considerable portion of heat is removed. The partially cooled gas then flows into an oil separator, where the oil is trapped out, and returned to the compressor. Vapor then passes into cascade condenser, cooled by High Temperature Refrigerant, where heat is removed and vapor changes to a liquid. The liquid then passes through a drier to the high side of the expansion valve. The expansion valve feeds Low Temperature Refrigerant to the evaporator, where it picks up heat and is again changed to a vapor. Vapor then enters the suction line and passes through an accumulator and a crankcase pressure regulating valve to the suction side of the compressor.

The Low Temperature Refrigerant phase of the cascade system is vapor charged. This means the refrigerant is charged into the system as a vapor. With both compressors off (inoperative) and

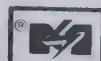
the entire Low Temperature System at room temperature, refrigerant is charged into system until high pressure gauge reads the proper pressure for the existing ambient temperature, as given on the "Low Stage System Charging Table" enclosed with these instructions or the refrigeration schematic. Pressure never exceeds 200 PSIG. If refrigerant was fed in as a liquid and then allowed to reach ambient temperature, the pressure exerted on the system would be between 475 and 575 PSIG. Vapor charging is therefore necessary, for safety.

The HIGH TEMPERATURE Phase of the Cascade System operates as follows:

The compressor puts refrigerant vapor under pressure and passes it through the discharge service valve. In this state, it passes into the condenser, either air or water cooled, where heat is removed and vapor changed to a liquid. From condenser receiver, liquid flows through receiver liquid line valve, through a drier and into High Temperature Refrigerant expansion valve at cascade condenser. Here, the High Temperature System refrigerates the Low Temperature refrigerant, taking the heat from its vapor, and condenses it to a liquid. The High Temperature refrigerant vapor then enters the suction line and returns to the suction side of compressor, thus completing the cycle.

On systems over 10 HP, an interlocking time delay relay is installed between High and Low Temperature motor compressors. This time delay can be manually adjusted from 2 to 15 seconds, between the starting of the motor compressors, therefore eliminating the possibility of both units starting simultaneously. The units are electrically interlocked so at any time the High Temperature unit should be inoperative due to high pressure cut-out or motor overload cut-out, the Low Temperature unit will also be inoperative. If Low Temperature unit should be stopped by its high pressure cut-out switch, High Temperature unit will continue to operate. This is desirable because High Temperature refrigerant entering the cascade condenser will rapidly reduce temperature and pressure of Low Temperature refrigerant, which in turn will close the contacts of high pressure cut-out switch and start Low Temperature unit.

Both systems contain all the safety devices usually encountered on commercial applications, which include high pressure cut-out switches, thermal motor overload cut-outs and high pressure relief valves. On water cooled units, there is also an automatic water regulator to control water flow to the condenser and desuperheater in exact accordance with requirements.

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MAINTENANCE AND GENERAL INFORMATION

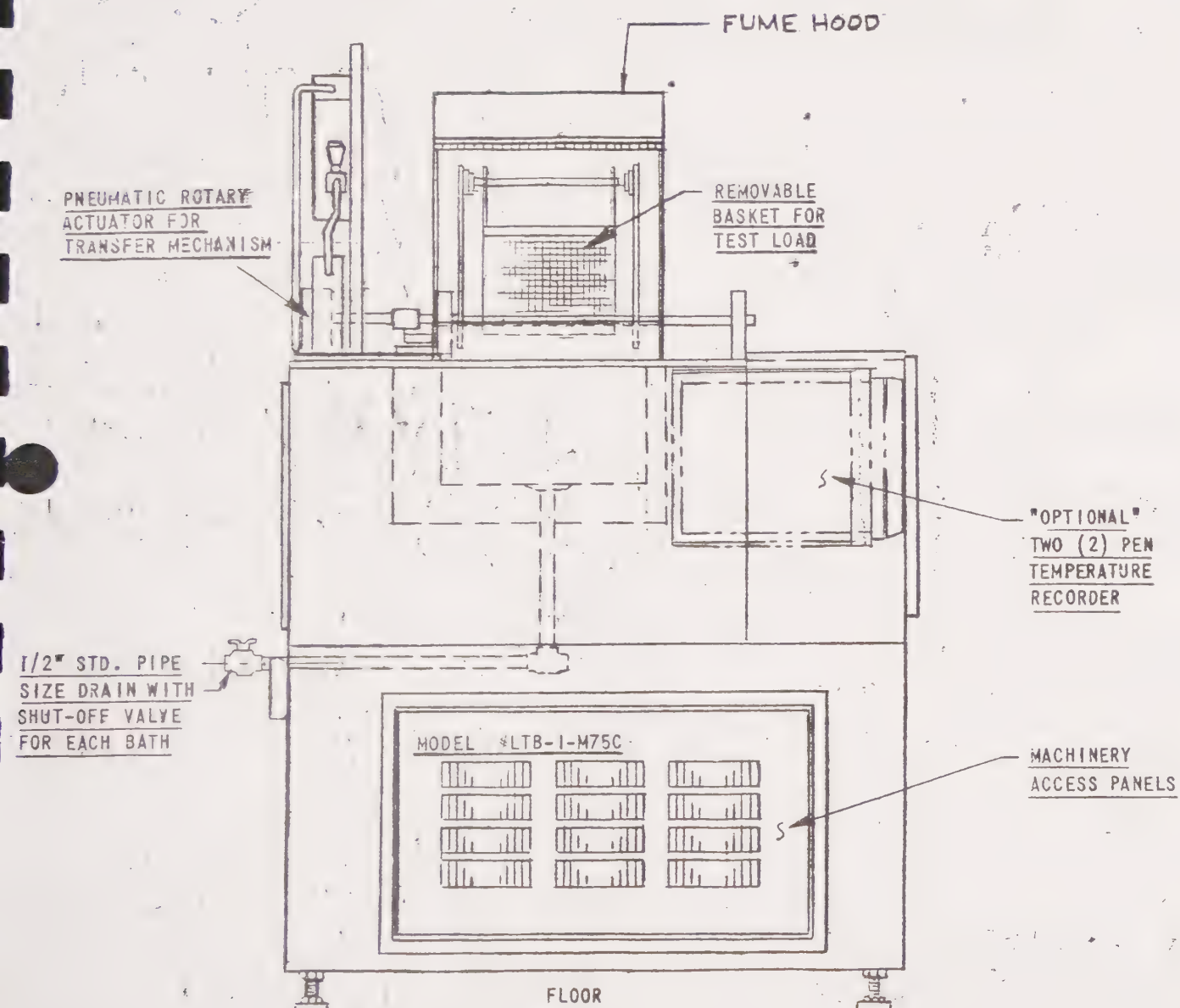
A review of the pressure temperature chart enclosed will act as a guide in service maintenance on the refrigerant Low Temperature System. In general, the Low Temperature refrigerant operation pressures will be as follows:

Stand-by pressures on high and low side of system are equalized approximately at 140 to a maximum of 200 PSIG, depending on size of expansion tank. Immediately upon starting, both systems are at ambient conditions; therefore, discharge pressure of Low Temperature unit will rise to the setpoint of the high pressure cut-out, which will stop Low Temperature compressor. High Temperature compressor will continue to operate, lowering the temperature of the cascade condenser. This condition continues until the high pressure of the Low Temperature refrigerant is lowered to cut-in setting of high pressure control (usually about 120 PSIG), high pressure control closes, starting Low Temperature compressor.

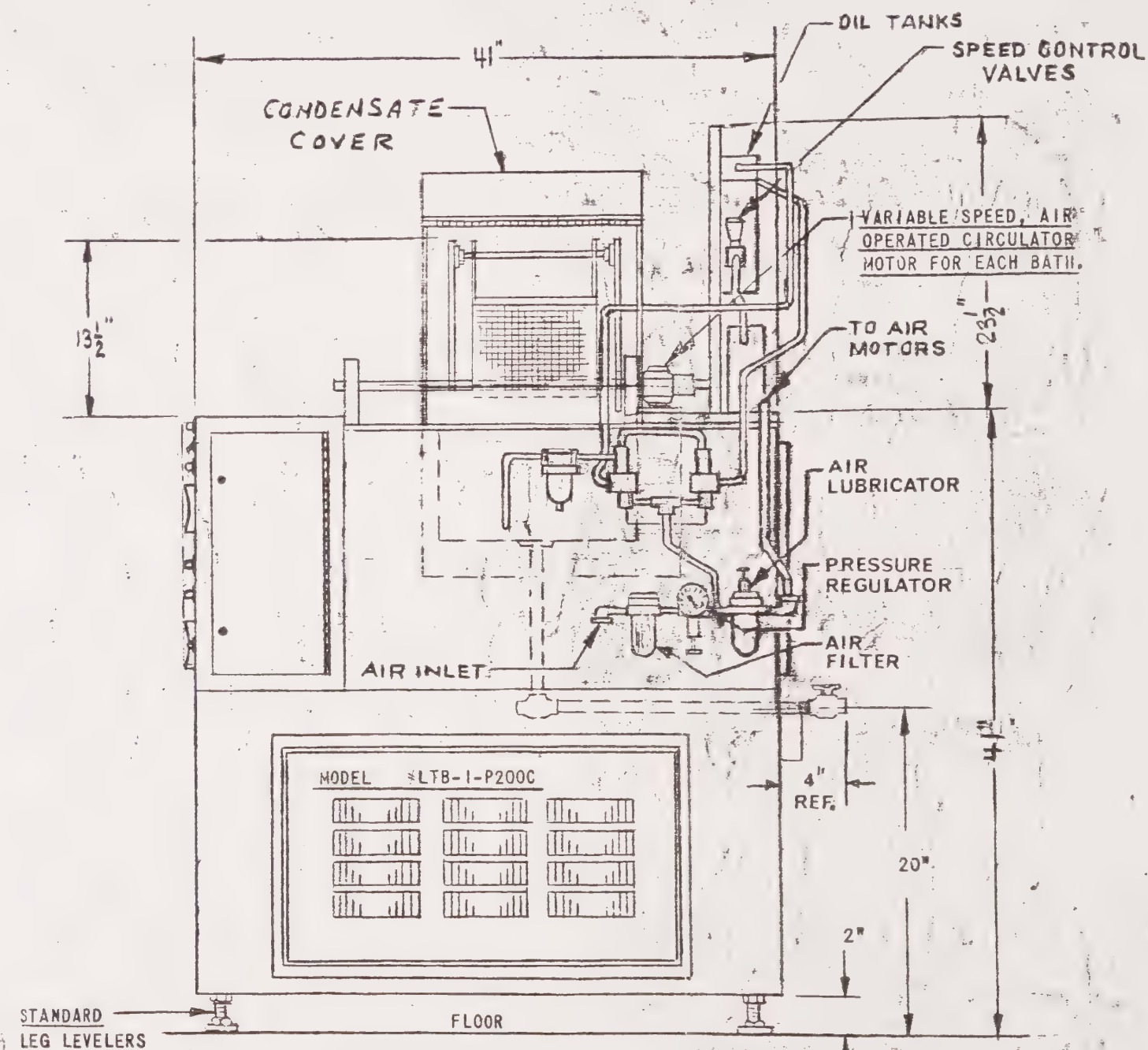
At this time, Low Temperature refrigerant vapor is being condensed in cascade condenser and passes into the cooling coils. Suction pressure will drop from its equalized stand-by condition to approximately 10 to 20 PSIG, where it will remain during initial phase of cooling. Discharge pressure of Low Temperature System will hold at 160 to 220 PSIG during initial phase of cooling test chamber. As temperature in chamber is reduced, cascade condenser will be cooled to a lower degree by High Temperature unit, and Low Temperature refrigerant discharge pressure will reduce to approximately -100°F. Discharge pressure of Low System will be approximately 90 to 120 PSIG, at which time, refrigerant suction pressure will be approximately 5 in. Hg. to 2 PSIG.

Pressure limitations of High Temperature refrigerant system will be dependent somewhat on temperature of air or water passing through condenser. In general, discharge pressure will be approximately 150 to 200 PSIG and suction pressure will be 5 in. Hg. to 15 PSIG depending on chamber temperature. When first cooling chamber, High Temperature suction pressure will usually be between 8 to 15 PSIG and when chamber temperature is reduced to lower points, the reduction in load on the High Temperature unit will result in a High Temperature suction pressure between 0 and 5 PSIG.

These systems can be serviced with the same tools, leak detector gages and accessories as are required for normal commercial re-



LEFT SIDE



RIGHT SIDE

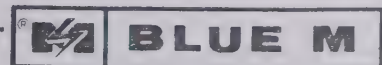
CHKD.	APPD.	LET.	REVISIONS	BY	DATE
KIS	HIC	F	ADDED CONDENSATE COVER	REY	2-26-80
~	~	E	TRANSFER SYSTEM CHANGED TO AIR OVER OIL	RAY	5-25-79
~	~	D	REVISED PNEUMATIC PIPING	CAL	9-22-75

		BLUE M		BLUE M <i>Electric Company</i>	
BLUE ISLAND, ILLINOIS, U.S.A.					
PART NAME		MODEL # LT3-ATS-2 (SINGLE BASKET) AUTOMATIC TRANSFER SYSTEM			
USED ON		LTB-1-P200C and LTB-1-M75C			
SCALE 3/32"=1"		DATE 9/11/70		DRAWING NO. SHEET 2 OF 2	
DRAWN CK		CHECKED		BC-513-2	
				REV F	

PRESSURE TEMPERATURE RELATIONS

<u>Degrees Fahrenheit</u>	<u>R-12</u>	<u>R-22</u>	<u>R-502</u>	<u>R-13</u>
120	157.6	259.9	280.3	
110	136.4	226.3	245.8	
100	117.2	195.9	214.4	
90	99.8	168.4	185.8	
80	84.2	143.6	159.9	520.8
70	70.2	121.4	136.6	458.7
60	57.7	101.6	115.6	402.3
50	46.7	84.0	96.9	351.2
40	37.0	68.5	80.2	304.9
30	28.5	54.9	65.4	263.2
20	21.0	43.0	52.5	225.7
10	14.6	32.8	41.1	192.1
0	9.2	24.0	31.2	162.1
- 5	6.7	20.0	26.8	148.7
- 10	4.5	16.5	22.8	135.4
- 15	2.4	13.2	19.0	123.5
- 20	0.6	10.1	15.5	111.7
- 25	* 2.3	7.4	12.3	101.3
- 30	* 5.5	4.9	9.4	90.9
- 35	* 8.4	2.7	6.7	81.8
- 40	* 11.0	0.5	4.3	72.7
- 45	* 13.3	* 2.6	2.1	64.6
- 50	* 15.4	* 6.2	0.0	57.0
- 55	* 17.3	* 9.1	* 3.6	50.0
- 60	* 19.0	* 12.0	* 7.0	43.5
- 65	* 20.5	* 14.4	* 10.0	37.5
- 70	* 21.8	* 16.6	* 12.6	32.0
- 75	* 23.0	* 18.5	* 15.0	27.9
- 80	* 24.1	* 20.2	* 17.1	22.3
- 85	* 24.9	* 21.6	* 19.0	18.1
- 90	* 25.7	* 23.0	* 20.6	14.2
- 95	* 26.4	* 24.1	* 22.1	10.7
-100	* 27.0	* 25.0	* 23.3	7.5
-105	* 27.4	* 25.9		4.8
-110	* 27.9	* 26.6		2.1
-115	* 28.2	* 27.2		* 0.2
-120	* 28.6	* 27.7		* 4.5
-125	* 28.8	* 28.1		* 8.0
-130	* 29.1	* 28.5		* 11.4
-135		* 28.8		* 14.1
-140		* 29.0		* 16.8
-145		* 29.2		* 18.8
-150		* 29.4		* 20.8

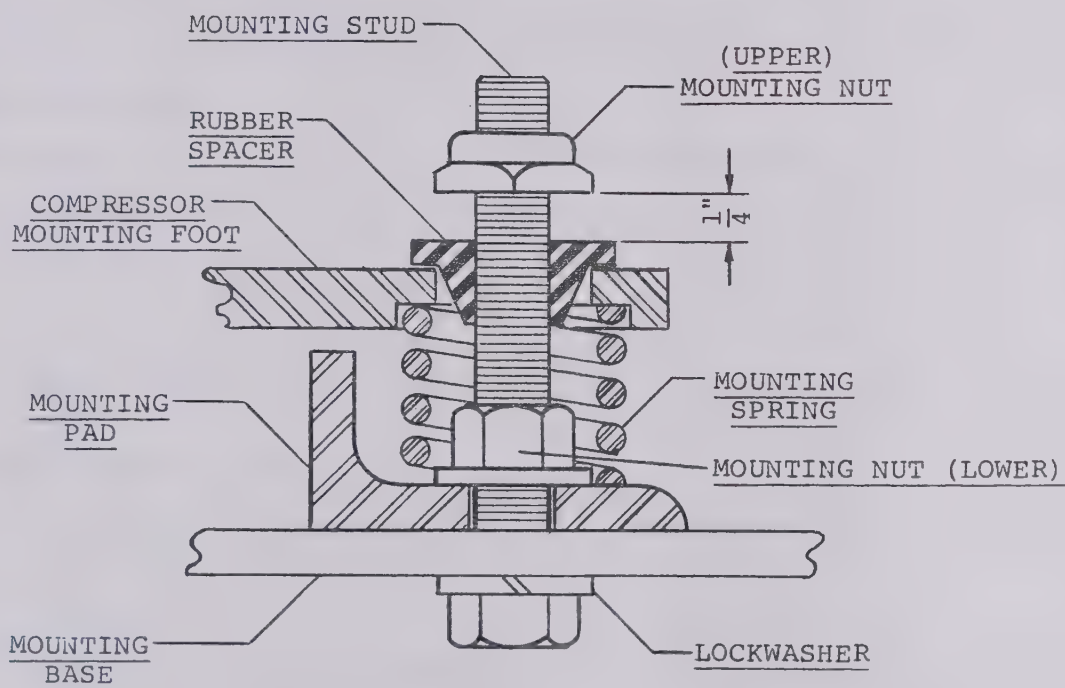
* Inches of Vacuum



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TYPICAL COPELAND COMPRESSOR MOUNT

NOTE: RUBBER SPACERS ARE REMOVED FOR SHIPMENT AND ATTACHED TO COMPRESSOR. AT INSTALLATION, REPLACE RUBBER SPACERS AND POSITION MOUNTING NUT ON STUD AS ILLUSTRATED.

SECTION VIEW

FINAL PERFORMANCE TEST, CALIBRATION AND INSPECTION RECORD SHEET
FOR 1004, 1002, TC-40, TC-120, AND LTB REFRIGERATED UNITS

MODEL NO. _____ CUSTOMER _____

JOB NO. _____ SER. NO. _____ CITY _____ STATE _____

POWER VOLTAGE _____ P.O. NO. _____

INSPECTED BY _____ TESTED BY _____

RELEASED FOR SHIPMENT BY _____ DATE _____

REFERENCE INFORMATION

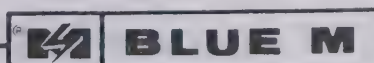
WIRING DIAGRAM _____ REFRIGERATION SCHEMATIC _____

REFRIGERATION DATA SHEET _____ PROGRAM WORK SHEET _____

SPECIAL INSTRUCTIONS _____

PRELIMINARY INSPECTION CHECK

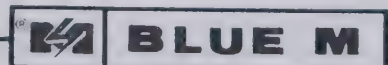
1. Check specification name plate data against printed order, packing slip and wiring diagram.
2. Check unit for
 - a) Damage and workmanship
 - b) Loose connections
 - c) Correct dials and chart scales
 - d) Correct bellows on controls
3. Check packing slip to see that all special modifications and accessories listed are supplied.
4. Refrigeration piping installed in keeping with recommended shop practice.
5. Oil added to separator.
6. All refrigeration lines checked for specified size.



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7. Water lines checked for proper size.
8. Cascade condenser, desuperheater and evaporator coils properly cleaned and dried.
9. Vibration eliminators properly installed.
10. Vibration loops installed for pressure switches, pressure gauges and oil return lines.
11. All refrigeration lines properly supported.
12. Dry nitrogen used during all brazing operations to prevent internal oxidation of tubing.
13. Oil level checked on both compressors.
14. Preliminary leak test of both systems.
15. Evacuation
 - a) Low stage system evacuated _____ hours, to _____ microns.
 - b) High stage system evacuated _____ hours, to _____ microns.
16. High stage system charged with _____ lbs. _____ ozs. _____ Refrigerant
17. Low stage vapor charged to a standby pressure of _____ PSIG., at _____ °F. Refrigerant _____.
18. All electrical control circuits checked for continuity and correct operating sequence in accordance with the wiring diagram and operating instruction.
19. Ohmeter test for grounded components.
20. Fuses checked for proper size.
 - a) Item # _____ Part # _____
 - b) Item # _____ Part # _____
 - c) Item # _____ Part # _____
 - d) Item # _____ Part # _____
21. Overload protection heater elements checked for proper size.
 - a) Item # _____ Part # _____
 - b) Item # _____ Part # _____

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c) Item # _____ Part # _____

d) Item # _____ Part # _____

22. Adjust all pressure controls, to the control scale calibration, in accordance with the specified pressure settings as determined from the refrigeration data sheet for the specific model.
23. Install test thermocouples to the refrigeration lines, for the purpose of checking the operating superheat of all thermo-expansion valves.
24. Door gaskets properly fit and secured.
25. Door, hinges and latches checked for proper adjustment and fit.

OPERATION AND CALIBRATION

1. Check blower rotation, including single phase models, _____ AMPS.
2. Crankcase pressure regulating valve adjusted for a maximum operating pressure of _____ PSIG.
3. Motor compressor FLA nameplate rating is _____ AMPS. Running amperage under full load operating condition at a chamber temperature of approximately +75°F. is:
 - a) R-22 compressor _____ AMPS.
 - b) R-13 compressor _____ AMPS.
4. R-22, H.P.C.O. control "PS-1", adjusted for _____ PSIG cut-out and _____ PSIG cut-in, as per instruction I-1015-25.
5. Water regulating valve adjusted to maintain an operating head pressure of _____ PSIG., as per instruction I-1015-24.
6. R-13, H.P.C.O. control, "PS-2", adjusted for _____ PSIG cut-out and _____ PSIG cut-in, as per instruction I-1015-26.
7. R-13, H.P.C.I. control, "PS-3", adjusted for _____ PSIG cut-in and _____ PSIG cut-out, as per instruction I-1015-27.

NOTE: The large majority of our Cascade Refrigeration systems use Refrigerant-22 in the high stage system and Refrigerant-13 in the low stage system. When other refrigerants are used, please correct the referenced R-22 and R-13 identifications, per Items B-3 through B-12 with the proper refrigerants.

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8. R-22, L.P.C.O. control, "PS-4", adjusted for _____ PSIG cut-in and _____ PSIG cut-out, as per instruction I-1015-24.
9. Hot gas bypass regulator valve adjusted for _____ PSIG, when operating in the bypass mode.
10. R-22 Thermo-Expansion valve superheat settings. Operating low side pressure _____ PSIG, control sensing bulb temperature, minimum _____ °F., Maximum _____ °F., time/valve cycle _____ minutes, average superheat _____ °F.
11. R-13 Thermo-Expansion valve superheat seeing. Operating low side pressure _____ PSIG, control sensing bulb temperature, minimum _____ °F., maximum _____ °F., time/valve cycle _____ minutes, average superheat _____ °F.
12. R-13, desuperheater T.E.V. superheat setting. Operating low side pressure _____ PSIG, control sensing bulb temperature, minimum _____ °F., maximum _____ °F., time/valve cycle _____ minutes, average superheat _____ °F, chamber air temperature when valve shuts off and maintains a fully closed position is _____ °F.
13. Air heater rating is _____ KVA. Under maximum air heating conditions, the voltage to the air heater is _____ Volts, and _____ AMPS. Resulting in a total heating input of _____ Watts.
14. Thermostat, Item # _____ adjusted to acuate at _____ °F.
15. Control calibrated at _____
As per instruction no. _____
16. Marshalltown indicator calibrated at _____
As per instruction no. _____
17. Overtemperature protection control calibrated at _____ °F.
18. Flange bolts on thermo-expansion valves tightened during low temperature operation.

PERFORMANCE TESTING

1. Maximum rates of temperature change.

All tests performed with the following loads:



BLUE M Electric Company

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Product Load _____

Heat dissipation _____ Watts.

a) Heat up rate

From _____ °F. to _____ °F. in _____ minutes

b) Cool down rate

From _____ °F. to _____ °F. in _____ minutes

STEADY STATE TESTS

a) Operating Temperature _____ °F., time at temperature _____

Operating conditions

R-22, L.P. _____ PSIG, H.P. _____ PSIG

R-13, L.P. _____ PSIG, H.P. _____ PSIG

Air heater input _____ Watts.

Product loads _____

b) Operating temperature _____ °F., time at temperature _____

Operating conditions

R-22, L.P. _____ PSIG, H.P. _____ PSIG

Air heater input _____ Watts.

Product loads _____

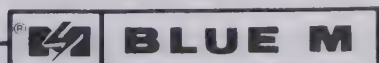
c) Operating temperature _____ °F., time at temperature _____

Operating conditions

R-22, L.P. _____ PSIG, H.P. _____ PSIG

Air heater input _____ Watts.

Product loads _____



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FINAL INSPECTION

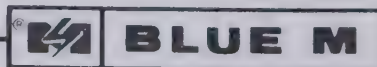
1. Final leak test of both systems.
2. Suction lines insulated.
3. All valve packing glands tightened and valves checked for proper position.
4. Water lines drained and winterized.
5. Compressors bolted down for shipment.
6. All removable panels secured.
7. All cabinet panels and penetrations checked for proper vapor sealing.
8. All nameplates installed.
9. Instrumentation secured for shipment.
10. All instruction tags installed.

COMMENTS

REMARKS

Attach recorder test chart and return this record to the service department for filing.

11/79

**BLUE M** *Electric Company*

Corporate Headquarters: Blue Island, Illinois 60406

CASCADE REFRIGERATION SYSTEM DATA SHEET

HIGH STAGE REFRIGERANT R- 22

LOW STAGE REFRIGERANT R- 13

LOW STAGE SYSTEM CHARGING TABLE

AMBIENT TEMPERATURE	60°F.	70°F.	80°F.	90°F.	100°F.
CHARGE UNTIL SYSTEM PRESSURES ARE	130 PSIG	135 PSIG	140 PSIG	145 PSIG	150 PSIG

CHARGE THE LOW STAGE SYSTEM WITH GAS ONLY AND ONLY WHEN THE ENTIRE SYSTEM IS AT ROOM TEMPERATURE IN ACCORDANCE WITH THE PRECEDING TABLE.

NOTES:

- (1) CHARGE THE HIGH STAGE SYSTEM WITH 5 LBS.
- (2) ADJUST C.P.R. VALVE, ITEM "NO. 28" FOR 12 PSIG-M.O.P.
- (3) ADJUST H.P.C.O. "PS-1" FOR 260 PSIG CUT-OUT AND 170 PSIG CUT-IN.
- (4) ADJUST H.P.C.O. "PS-2" FOR 225 PSIG CUT-OUT AND 125 PSIG CUT-IN.
- (5) ADJUST H.P.C.I. "PS-3" FOR 150 PSIG CUT-IN AND 80 PSIG CUT-OUT.

MODEL NO. LTB-1-M75C

RD-347-17-1

Date:
3-27-69

Checked:

BY:
WT

Approved:



BLUE M Engineering Company

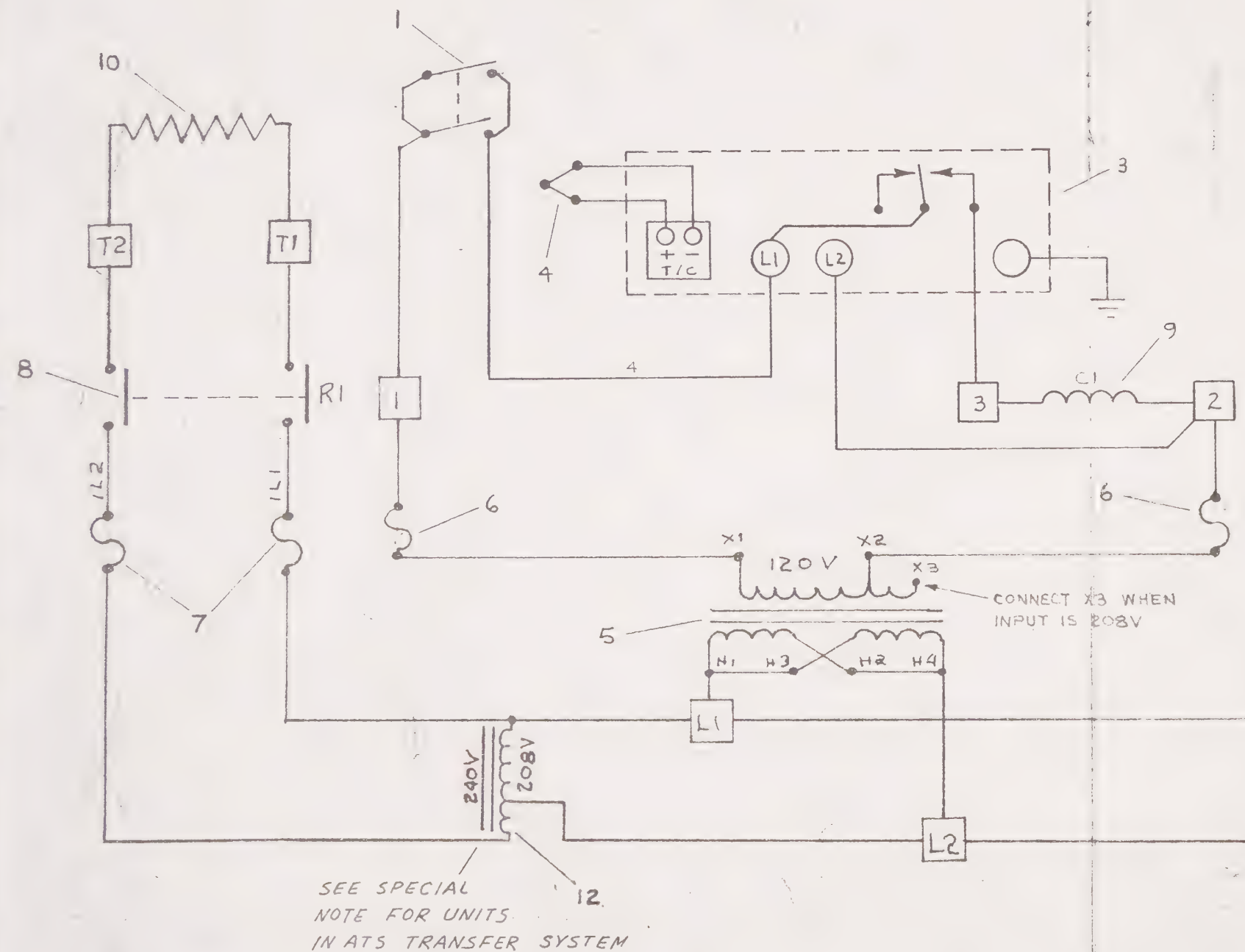
A DIVISION OF BLUE M ELECTRIC COMPANY
Corporate Headquarters: BLUE ISLAND, ILLINOIS 60406

WIRING DIAGRAM AND REPLACEMENT PARTS LIST

WD-864-4D

MODEL NUMBER: LTB-1-P200B,C,Y
 INSIDE DIMENSIONS: 14L x 10W x 8D

MAX. TEMPERATURE: To 204°C (400°F)
 HEATING ELEMENT: 2 KW
 VOLTAGE: 208, 240V/1ph/60cy (50 Hz)



REPLACEMENT PARTS LIST

ITEM NO.	DESCRIPTION	PART NUMBER	NO. REQD.
1	Main Switch	E16A-5	1
2			
3	Temperature Control	C04B-1-37	1
4	Thermocouple with lead wire	C11B-2-3	1
5	Control Transformer 240V/120V	E17B-2-2	1
6	Control Circuit Fuses	E04A-2	2
7	Power Fuses	E04A-10	2
8	Mercury Relay	E02B-1-1	1
9	Relay Coil	Supplied with Relay	
10	Heating Element	E05A-26	1
11	Thermometer (0°C to 250°C)	C01B-25	1
**12	Autotransformer 208V/240V	E17A-2-4	1
13			
*14	AGITATION MOTOR	MIS-B1	1
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25	NOTE: ITEM 12 NOT REQUIRED FOR 208V UNITS		
26	WITH ATS TRANSFER SYSTEM SEE WD-864-6		
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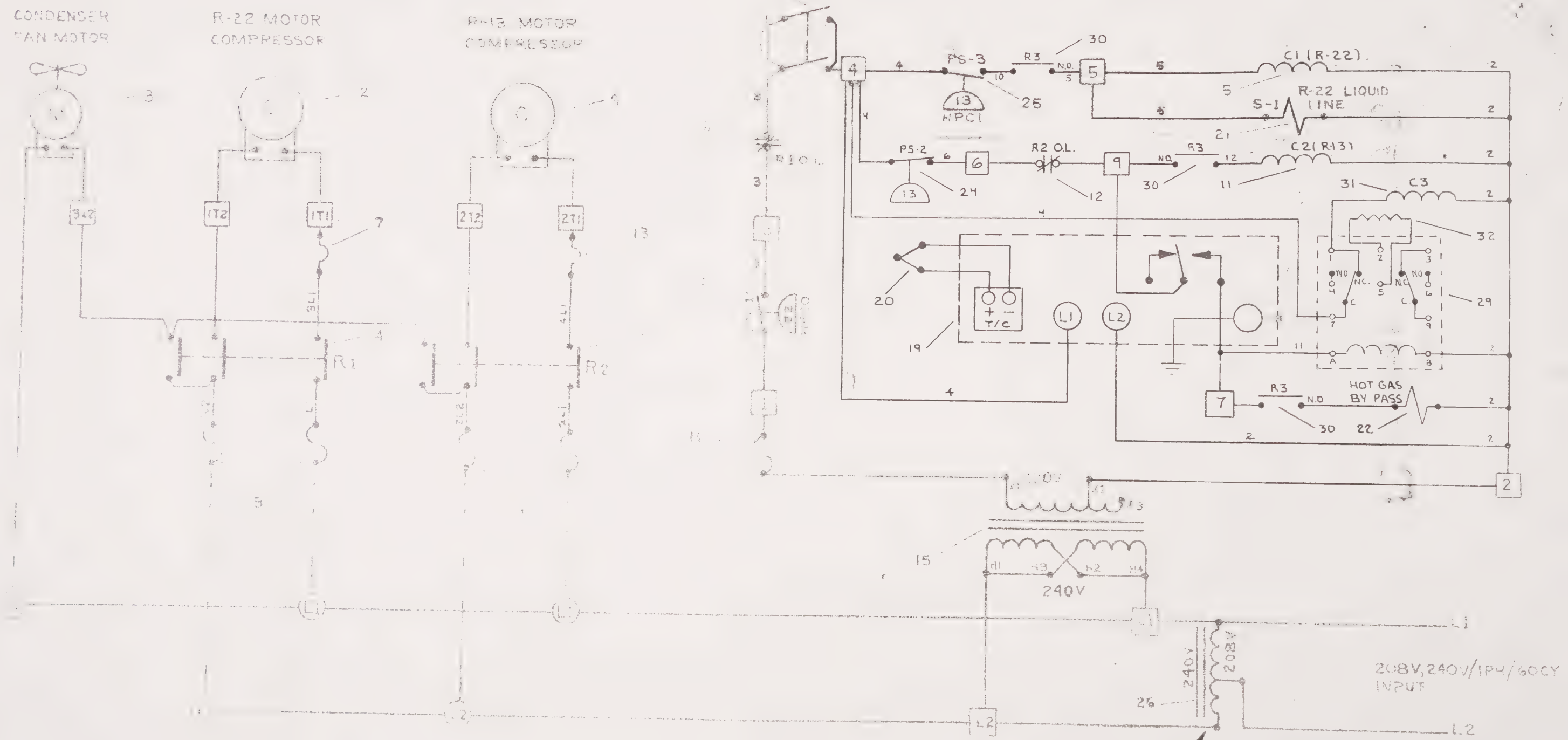
PARTS NOT SHOWN
 OPTIONAL ACCESSORIES

REV. D	ADD AUTOFORMER NOTES	3-8-76
REV. C	ITEM 2 MAIN PILOT REMOVED 11-18-74	
REV. B	ITEM #3 WAS C04B-1-13	8-13-74
REV. A	PARTS LIST REVISED	10-2-74

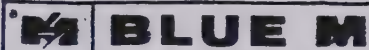
DATE 4-3-69 DRAWN MJL CHECKED VIT

PARTS SHIPPED F.O.B. BLUE ISLAND, ILLINOIS.
 WHEN ORDERING PARTS, GIVE MODEL NO., SERIAL NO., VOLTAGE AND PART NO.

Rev	Reason	Date	BLUE M Electric Company	Date: 11-25-68	WD-864-2G
A	TERMINALS (WIPE NUMBERS ADDED.	3-11-69	Corporate Headquarters: BLUE ISLAND, ILLINOIS 60406	Page 2 of 2	
B	PARTS LIST REVISED	2-18-70			
C	ITEM #19 WAS CO4B-1-13	8-12-74	MODEL NUMBER: LTB-1-M75C(Y)	Drawn: <i>WJ</i>	Checked: <i>WT</i>
D	MAIN PILOT LIGHT #18 REMOVED	11-18-74	VOLTAGE: 208, 240V/1ph/60cy (50 Hz)	INTERIOR DIMS. 10 1/2" x 14 1/2" x 7 1/2"	
E	ADD AUTOFORMER NOTES	3-8-76	MAXIMUM WATTS: 3 KVA.	TEMP. RANGE: 0°C to 15°C	
F	REVISE PART LIST	7-20-76			
G	ADDED C3 AND TR	9-24-79	BY: G.D. CHK: <i>WJ</i> APP: <i>WJ</i>		



NOTE: ITEM 26 NOT REQUIRED FOR 208V UNITS WITH ATS TRANSFER SYSTEM. SEE WD-864-6


BLUE M Electric Company

Corporate Headquarters: BLUE ISLAND, ILLINOIS 60406

 MODEL NUMBER: LTB-1-M75C (Y)
 VOLTAGE: 208V, 240V/1 Ph/60 Hz. (50 Hz)
 MAX. TEMPERATURE: 0°C to -75°C
 MAX. WATTS: 3 KW
 INTERIOR DIMENSIONS: 10W x 14L x 7D

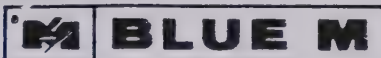
PWD-864-2G

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 *PARTS NOT SHOWN
 **OPTIONAL ACCESSORIES

Parts shipped F. O. B. Blue Island, Illinois. — When ordering parts, give Model No., Serial No., Voltage and Part No.

ITEM	DESCRIPTION	PART NUMBERS	REQ'D.
1	Agitation Motor Assembly	M15-B1	1
2	R-22 Motor Compressor 3/4 HP (50 Hz, use R28B-10)	R28B-02	1
3	Condenser Fan Motor	supplied with above	
4	R-22 Compressor Contactor	E02A-12-4	1
5	R-22 Compressor Contactor Coil	supplied with contactor	
6	R-22 Compressor Overload Relay	E11C-1	1
7	R-22 Compressor Overload Heater	E11D-N25	1
8	R-22 Compressor Fuses	E04A-8	2
9	R-13 Motor Compressor 3/4 HP (50 Hz, use R28B-10)	R28B-02	1
10	R-13 Compressor Contactor	E02A-12-4	1
11	R-13 Compressor Contactor Coil	supplied with contactor	
12	R-13 Compressor Overload Relay	E11C-1	1
13	R-13 Compressor Overload Heater	E11D-N25	1
14	R-13 Compressor Fuses	E04A-8	2
15	Control Circuit Transformer 240V/120V	E17B-2-2	1
16	Control Circuit Fuses	E04A-2	1
17	Cooling Switch	E16A-5	1
18			
19	Temperature Control - Dialatrol with Down-Scale Burn-out	C04B-1-37-DSB	1
20	Thermocouple with Lead Wire	C11B-2-3	1
21	R-22 Liquid Line Solenoid Valve	E14E-1-1	1
22	R-13 Hot Gas Bypass Solenoid Valve	E14E-3-1	1
23	(PS-1) High Pressure Cut-Out R-22	R37B-01	1
24	(PS-2) High Pressure Cut-out R-13	R37B-01	1
25	(PS-3) High Pressure Cut-in R-13	R37B-02	1
*26	Autotransformer, Enclosed 208V/240V	E17D-4-1	1
*27	Dial Thermometer (-100°C to +40°C)	C01E-24	1
28			
29	TIME DELAY RELAY (120 SEC.)	E02H-2-1	1
30	RELAY R3 (4 POLE, NO CONTACTS)	E02A-12-4	1
31	RELAY COIL C3	SUPPLIED W/RELAY	
32	RESISTOR 1M OHMS (PROVIDES 60 SEC. DELAY)	E03R-3-1M	1
33			
34			
35			
36			
37	NOTE: ITEM 26 is required only for 208 Volt units		
38	without ATS Transfer System. See WD-864-6		
39			
40			
41			
42			
43			
44			
45			
46	REV.	REASON	BY: CHK: APP: DATE
47	G	ADDED ITEMS 29-32, ITEM 16 WAS QUANTITY 2.	GD. W/S W/S 9-26-79
48	W	ITEM 29 WAS E02C-10	GD 4/3 W/S 6-17-80
49	W	ITEM 32 WAS E03R-3-200K	GD W/S W/S 7/2/80
50			



BLUE M Electric Company

Corporate Headquarters: BLUE ISLAND, ILLINOIS 60408

PWD-864-6D

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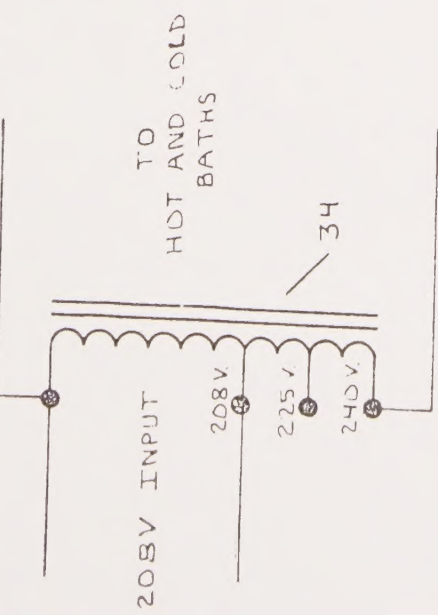
MODEL NUMBER: LTB-ATS-2
VOLTAGE: 120V/1PH/60HZ (50HZ)
MAX. TEMPERATURE: _____
MAX. WATTS: _____
INTERIOR DIMENSIONS: _____

*PARTS NOT SHOWN
**OPTIONAL ACCESSORIES

Parts shipped F. O. B. Blue Island, Illinois. - When ordering parts, give Model No., Serial No., Voltage and Part No.

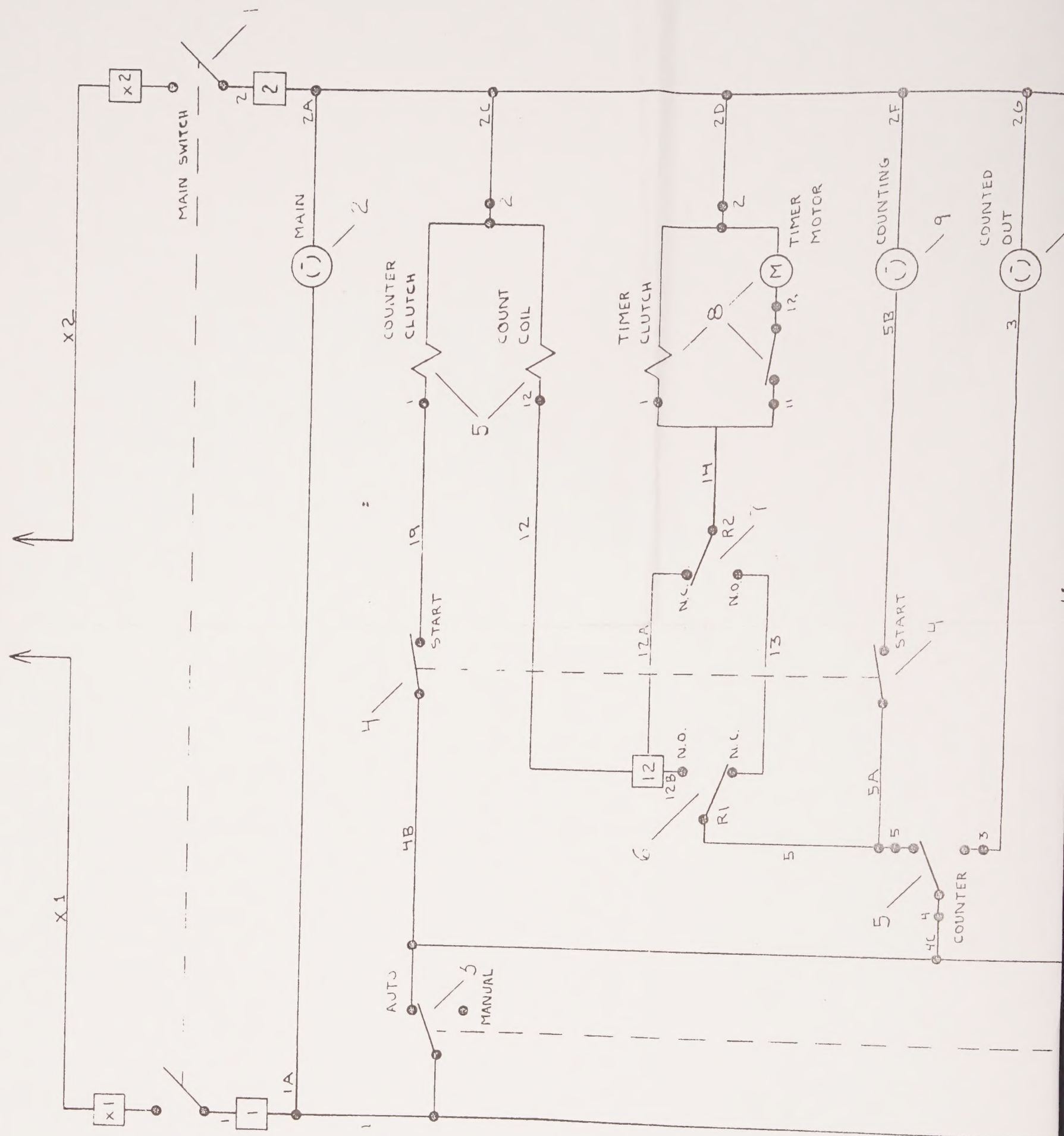
ITEM	DESCRIPTION	PART NUMBERS	REQ'D.
1	MAIN SWITCH	E16A-5	1
2	MAIN PILOT LIGHT - RED	E06B-2	1
3	MANUAL/AUTOMATIC SELECTOR SWITCH	E16A-8	1
4	COUNTER SWITCH DPST	E16A-14	1
5	CYCLE COUNTER 50/60HZ	C12J-5	1
6	RELAY R1 DPDT	E02C-6	1
7	RELAY R2 4PDT	E02C-12	1
8	HOLD TIMER (50HZ USE EAGLE #HP56A5)	C12C-7	1
9	COUNTING PILOT LIGHT - AMBER	E06B-1	1
10	COUNTED OUT PILOT LIGHT - WHITE	E06B-3	1
11	LIMIT SWITCH	E16H-18	1
12	RELAY R3 DPDT	E02C-6	1
13	MANUAL POSITION SELECTOR SWITCH	E16A-9	1
14	RIGHT POSITION PILOT LIGHT - RED	E06B-2	1
15	LEFT POSITION SOLENOID VALVE	E14B-2-2	1
16	LEFT POSITION PILOT LIGHT - BLUE	E06B-4	1
17	RIGHT POSITION SOLENOID VALVE	E14B-2-2	1
18			
19			
20			
21			
22			
23			
24			
*25	COLD BATH		1
*26	HOT BATH		1
*27	PNEUMATIC ROTARY ACTUATOR	M15-C2	1
*28	CARTRIDGE BEARING	LCJT X 5/8" BORE	2
*29	COMBINATION FILTER, REGULATOR, LUBRICATOR	M15-D1	1
*30	EXPANSION OIL TANKS	M15-E1	2
*31	TANK EQUALIZER VALVE	M16A-21	1
*32	FILTER	M18-C2	1
*33	FLOW CONTROL VALVES	M17-A12	2
34	AUTOFORMER 8 KVA	E17A-2-6	1
35	NOTE: AUTOFORMER HANDLES BOTH BATHS		
36	AND ATS SYSTEM. AUTOFORMERS FOR		
37	INDIVIDUAL BATHS NOT REQUIRED		
38			
39			
40			
41	REV. REASON	DATE BY CHK	APP
42	D CHANGED TO AIR-OVER OIL SYSTEM & CTR POSITION		
43	LIMIT S.W. LTB-ATS-2 WAS LTB-ATS-1	6/21/79 DL RR	WS
44	~ ADDED AUTOFORMER	2/18/80 T T	WS
45			
46			
47			
48			
49			
50			

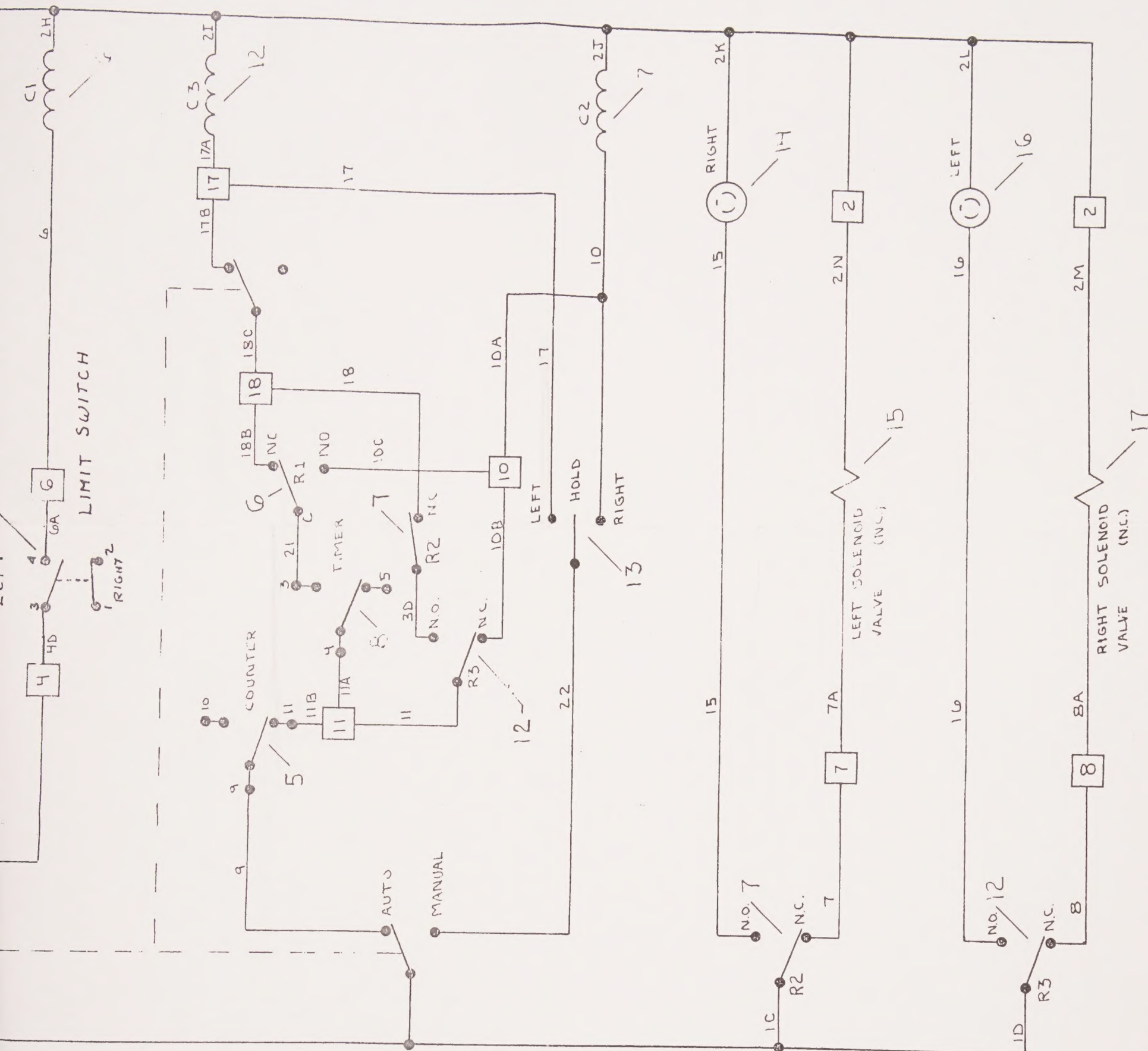
REQUIRED FOR
0V.-208V. UNITS ONLY



AUTOFORMER MOUNTED INSIDE
BASE OF HOT BATH. AUTOFORMER
HANDLES BOTH BATHS AND ATS
SYSTEM. AUTOFORMERS FOR
INDIVIDUAL BATHS NOT REQUIRED.

120 VAC. - CONNECT TO
CONTROL TRANSFORMER OF
LTB-1-P200 (HOT BATH)





	D	REVISED TO AIR-OVER-OIL SYSTEM.	 BLUE M BLUE M Electric Company BLUE ISLAND, ILLINOIS 60406
		REPLACED END-OF-STROKE LIMIT SWITCHES	
		W/TH CENTER-POSITION LIMIT SWITCHES	
		ADDED REF. 2-7-79	
		ADDED REF. 2-8-80	
		ADDED REF. 2-8-80	
D WORKING NUMBERS	GD	2-7-80	
REVISIONS	LET.	REVISIONS	
			PART NAME WIRING DIAGRAM
			USED ON LTB-ATS-2
			SCALE 
			DATE 7-24-79
			DRAWING NO. WD-864-6
			REV. D
			DRAWN G.D.
			CHK.
			APP. 

MP MASTER



MA34372

DUO-TANG
51240
MADE IN U.S.A.